REMARKS/ARGUMENTS

The Pending Claims

Claims 1-5, 8-26, and 32-35 are pending. Claims 13-18 have been withdrawn in response to a restriction requirement. Therefore, claims 1-5, 8-12, 19-26, and 32-35 are subject to examination.

The Amendments to the Specification and Claims

The specification has been amended to insert sequence identifiers where appropriate, and to insert specific sequences encompassed by the consensus sequence L(I)DxxxKxxW(F) disclosed in the present application. A new sequence listing is being electronically filed concurrently herewith that reflects these changes. The specification also has been amended to include a reference to the electronically-filed sequence listing. No new matter has been added by way of the amendments or the sequence listing.

The claims have been amended to point out more particularly and claim more distinctly the present invention. Specifically, claim 1 has been amended to recite a method of increasing or decreasing the ion conductivity of a membrane, which comprises comprises inserting one or more light-controlled ion channels into a membrane, wherein the one or more light-controlled ion channels is a biological photoreceptor. These amendments are supported by the specification at, e.g., page 1, lines 18-21, page 11, lines 29-31, and the claims as originally filed. Claims 21 and 22 also have been amended to replace the term "altered" with the phrase "increased or decreased." Claims 25 and 26 have been amended to delete the term "intracellular" and to recite the phrase "concentration gradient." This amendment is supported by, e.g., claim 27 as originally filed. Claim 35 has been amended to recite that a light-induced membrane depolarization is realized by lowering the ion conductivity of the membrane by activating the one or more light-controlled ion channels by exposure to light. This amendment is supported by the specification at, e.g., page 13, lines 1-7.

Accordingly, no new matter has been added by way of these amendments.

The Office Action

Claim 8 is objected to because it allegedly does not comply with the sequence requirements of 37 C.F.R. §§ 1.821-1.825 and M.P.E.P. § 2422.03. Claims 1-5, 8-12, 19-26, and 32-35 are rejected under 35 U.S.C. § 112, second paragraph, for allegedly being indefinite. Claims 1-5, 19-23, and 32 are rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Hildebrandt et al., *Proc. Natl. Acad. Sci. USA*, *90*: 3578-3582 (1993) ("the Hildebrandt reference") as evidenced by Wald, *Nature*, *219* (5156): 800-807 (1968) ("the Wald reference"). Claims 1-5, 8-12, 19-22, and 35 are rejected under 35 U.S.C. § 102(a) as allegedly anticipated by Nagel et al., *Science*, *296*: 2395-2398 (2002) ("the Nagel reference").

Reconsideration of these objections and rejections is requested herein.

Discussion of Claim Objection and Sequence Compliance

Claim 8 allegedly does not comply with the sequence requirements of 37 C.F.R. §§ 1.821-1.825. In particular, the present application does not provide sequence identifiers which correspond to the 6 amino acid sequences encompassed by the consensus sequence L(I)DxxxKxxW(F,Y) disclosed in claim 8.

Applicants have amended the specification to include all 6 amino acid sequences encompassed by the consensus sequence L(I)DxxxKxxW(F,Y), and to include appropriate sequence identifiers. In addition, a substitute sequence listing is being submitted herewith to reflect these changes.

In view of the foregoing amendments and comments, Applicants respectfully submit that the present application complies with the sequence requirements of 37 C.F.R. §§ 1.821-1.825 and request the withdrawal of the objections to the claims and specification.

Discussion of Rejections under 35 U.S.C. § 112

Claims 1-5, 8-12, 19-26, and 32-35 are rejected under Section 112, second paragraph, as allegedly being indefinite. Specifically, the term "alter" in claims 1, 21, and 22 allegedly renders those claims vague. Claims 1, 21, and 22 have been amended to replace the term "alter" with the phrase "increasing or decreasing" or "increased or decreased."

Claim 1 allegedly is vague for omitting active steps by which the photoreceptor is configured to act as a light-controlled ion channel. Claim 1 has been amended to recite a method for increasing or decreasing the ion conductivity of a membrane, which comprises inserting one or more light-controlled ion channels into a membrane, wherein the one or more light-controlled ion channels is a biological photoreceptor.

Claims 25 and 26 allegedly are indefinite because the phrase "the intracellular concentration of ions across the membrane" is unclear. Claims 25 and 26 have been amended to delete the term "intracellular."

Claim 35 allegedly is indefinite for allegedly omitting active steps by which the depolarization is detected. Claim 35 has been amended to recite that membrane depolarization is realized by lowering the ion conductivity of the membrane by activating the one or more light-controlled ion channels by exposure to light.

In view of the foregoing, the metes and bounds of the pending claims are clear. As such, the rejections under Section 112, second paragraph, should be withdrawn.

Discussion of Rejections Under 35 U.S.C. § 102

Claims 1-5, 19-23, and 32 are rejected under Section 102(b) as allegedly anticipated by the Hildebrandt reference as evidenced by the Wald reference. This rejection is traversed for the reasons set forth below.

The Hildebrandt reference discloses the heterologous expression of bacteriorhodopsin in membranes of *S. pombe*. According to the Office Action, bacteriorhodopsin is known in the art as a seven transmembrane receptor, and the Hildebrandt reference discloses expression of bacteriorhodopsin in yeast in the presence of the chromophore retinal. The Wald reference allegedly discloses that binding of retinal to opsin leads to the formation of a covalent Schiff base.

Claim 1, as amended, is directed to a method for increasing or decreasing the ion conductivity of a membrane, which comprises inserting one or more light-controlled ion channels into a membrane, wherein the one or more light-controlled ion channels is a biological photoreceptor. Contrary to the allegations of the Office Action, bacteriorhodopsin

does not form an ion channel, as evidenced by the Hildebrandt reference itself and the Nagel reference. Bacteriorhodopsin is an active transporting system, also referred to in the art as a proton pump, which goes through a photo cycle upon absorption of a photon, thereby transporting a single charge by shifting a single proton from one side of a membrane to the other. In contrast, an ion channel is a passively operating ion transporting mechanism, which has an open or closed state. When an ion channel is open, charges are continuously transported according to the concentration gradient across the membrane. As such, the Hildebrandt reference does not disclose a method of altering the ion conductivity of a membrane by inserting a light-controlled ion channel into the membrane, as required by the pending claims.

The Wald reference does not disclose or suggest that bacteriorhodopsin forms an ion channel. In this respect, the Wald reference discloses that rhodopsin functions as a photoreceptor based on the isomerization of 11-cis-retinal into all-trans-retinal by light which induces a conformational change in rhodopsin. The conformational change then activates an associated G protein and triggers a second messenger cascade, but no ion channel is formed.

Therefore, neither the Hildebrand reference nor the Wald reference discloses the subject matter of claim 1, or claims depending therefrom.

Claims 1-5, 8-12, 19-22, and 35 are rejected under Section 102(a) as allegedly anticipated by the Nagel reference. This rejection is traversed for the reasons set forth below.

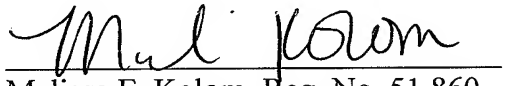
A publication qualifies as prior art under Section 102(a) if the publication was by another and occurred prior to the date of invention for the claims in issue. Here, the Nagel reference was published in June 2002. However, the date of invention for the claims in issue is at least as early as April 11, 2002, i.e., before the publication date of the Nagel reference, as demonstrated by the text of the German patent application to which the present application claims priority under 35 U.S.C. § 119. A certified English translation of the German patent application to which the present application claims priority is concurrently filed herewith. As is apparent from the English translation, the German patent application fully supports the pending claims, and it is clear that Applicants invented the subject matter of the pending claims prior to the publication of the Nagel reference. As a result, the Nagel reference is not prior art to the pending claims under 35 U.S.C. § 102(a).

In view of the foregoing, the Hildebrandt reference and the Nagle reference do not anticipate the subject matter of claim 1, or claims depending therefrom. Accordingly, the rejections under Section 102 should be withdrawn.

Conclusion

Applicants respectfully submit that the patent application is in condition for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned agent.

Respectfully submitted,



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